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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/707,822	01/14/2004	Chorng-Kuang Wang	MTKP0038USA	1821

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EXAMINER	
FLORES, LEON	

ART UNIT	PAPER NUMBER
2611	

NOTIFICATION DATE	DELIVERY MODE
05/16/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/707,822	WANG ET AL.	
	Examiner	Art Unit	
	LEON FLORES	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 March 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4,5,7,9,10 and 12-14* is/are pending in the application.

4a) Of the above claim(s) *3,6,8,11 and 15* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4,5,7,9,10 and 12-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments with respect to claims (1-2, 4-5, 7, 9-10, 12-14) have been considered but are moot in view of the new ground(s) of rejection.

Response to Remarks

Applicant asserts that, *"only one of the I-signal and the Q-signal is modified; that is to say, the Q-signal is modified due to a portion of the I-signal, but the I-signal remains intact" & "Rahman fails to teach or suggest modifying both of the I-signal and the Q-signal to achieve orthogonality between the I-signal and the Q-signal, the applicant therefore asserts that the claimed limitations "modifying the first signal by subtracting a portion of the first signal from the first signal" and "modifying the second signal by the portion of the first signal so that a phase difference between the modified second signal and the first signal becomes substantially close to 90 degrees" are neither taught nor suggested by Rahman"*

The examiner respectfully disagrees. The reference of Rahman does suggest the teaching of, "modifying the first signal (Cos(A) "unequalized I-signal") by subtracting a portion of the first signal from the first signal (0.5*sin(A+e) - 0.5*sin(A-e)" and "modifying the second signal by the portion of the first signal (0.5*sin(A+e) - 0.5*sin(A-e) so that a phase difference between the modified second signal and the first signal becomes substantially close to 90 degrees", as claimed. However, nowhere in the claims does the applicant claim that the I-signal does not remain intact.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

1. **Claims (1-2) are rejected under 35 U.S.C. 103(a) as being unpatentable over Rahman. (US Publication 2003/0174641 A1).**

Re claim 1, Rahman discloses a method for reducing phase mismatch in quadrature signals in an RF receiver, wherein the quadrature signals comprises a first signal and a second signal that are at about quadrature phase angles, the method comprises:

modifying the second signal by the portion of the first signal so that a phase difference between the modified second signal and the first signal becomes substantially close to 90 degrees. (See fig. 5: 146 & ¶s 35 & 38 "IQ phase imbalance correction loop". Furthermore, the Q component is modified by I component)

But the reference of Rahman fails to explicitly teach modifying the first signal by

subtracting a portion of the first signal from the first signal.

However, the reference of Rahman does suggest (See fig. 5: 80, 138, 142, 144 & ¶s 34-39) the teaching of modifying the first signal (Cos(A) "unequalized I-signal") by subtracting a portion of the first signal from the first signal. (0.5*sin(A-e) - 0.5*sin(A+e))Initially, the I component was equal to Cos(A) (See fig. 5: 80 & ¶ 37) but then it was modified by multiplying with Sin(e) (See fig. 5: 138 & ¶ 35) which is equivalent to 0.5*sin(A-e) - 0.5*sin(A+e). (See¶ 38) Furthermore, one of ordinary skills would know how to make and use of these mathematical equations in an IQ phasor plane in order to achieve orthogonality.

Therefore, it would have been obvious to one of ordinary skills in the art to have incorporated this feature into the system of Rahman, in the manner as claimed, for the benefit of achieving I/Q phase imbalance compensation. (See ¶ 35)

Re claim 2, the reference of Rahman further discloses compensating the portion of the first signal to the second signal to reduce phase mismatch in the pair of quadrature signals. (See fig. 5 & ¶s 35-39)

2. **Claims (4-5) are rejected under 35 U.S.C. 103(a) as being unpatentable over Wynn (US Patent 6,009,317), in view of Rahman. (US Publication 2003/0174641 A1), and further in view of Jeong (US Publication 2003/0095589 A1).**

Re claim 4, Wynn discloses a method used in an RF receiver for reducing an image cross talk, the RF receiver comprising: a first mixer and a second mixer for

receiving RF signals and respectively generating a first signal and a second signal that are at about quadrature phase angles; and a calibration modulecoupled to the pair of mixers for reducing phase mismatch in the pair of quadrature signals when the phase mismatch causes the image cross talk; the method comprising:
utilizing the pair of mixers to process the RF signal and to output the pair of quadrature signals. (See fig. 3: 74 & 76)

But the reference of Wynn fails to specifically disclose utilizing the programmable phase calibration device to reduce the phase mismatch in the pair of quadrature signals through modifying the first signal by subtracting a portion of the first signal from the first signal and modifying the second signal by a portion of the first signal.

However, the reference of Rahman does suggest (See fig. 5: 80, 138, 142, 144 & ¶s 34-39) the teaching of utilizing the programmable phase calibration device to reduce the phase mismatch in the pair of quadrature signals (See fig .5) through modifying the first signal (Cos(A) "unequalized I-signal") by subtracting a portion of the first signal from the first signal (0.5*sin(A-e) - 0.5*sin(A+e)) and modifying the second signal by a portion of the first signal. (0.5*sin(A+e) - 0.5*sin(A-e), which is equal to Sin(A)*Cos(e) Initially, the I component was equal to Cos(A) (See fig. 5: 80 & ¶ 37) but then it was modified by multiplying with Sin(e) (See fig. 5: 138 & ¶ 35) which is equivalent to 0.5*sin(A-e) - 0.5*sin(A+e). (See¶ 38) Furthermore, one of ordinary skills would know how to make and use of these mathematical equations in an IQ phasor plane in order to achieve orthogonality.

Therefore, taking the combined teachings of Wynn and Rahman as a whole, it

would have been obvious to one of ordinary skills in the art to have incorporated this feature into the system of Wynn, in the manner as claimed and as taught by Rahman, for the benefit of providing imbalance compensation.

The combination of Wynn and Rahman discloses the limitations as claimed above, except they do not specifically disclose that wherein two ports of the calibration module are respectively connected to two output ports of the pair of mixers.

However, Jeong does. (See fig. 1: elements 114 & 104 as a whole) Jeong discloses an apparatus for estimating and correcting gain and phase imbalance in a CDMA system. Gain and phase imbalance correction takes place after the incoming signal has been converted from RF to baseband and digitized. Furthermore, one skilled in the art would know that direct conversion receiver is achieved by downconverting or mixing the RF signal with a local oscillator.

Therefore, taking the combined teachings of Wynn, Rahman and Jeong as a whole, it would have been obvious to one of ordinary skill in the art to have modified the system of Wynn, as modified by Rahman, in the manner as claimed and as taught by Jeong, for the benefit of detecting and correcting gain and phase imbalances.

Re claim 5, the combination of Wynn, Rahman, and Jeong further discloses utilizing the programmable phase calibration device to compensate the portion of the first signal to the second signal so that phase difference between the compensated second signal and the first signal becomes 90 degrees. (In Rahman, see fig. 5: 146 & paragraph 35 “I/Q phase imbalance correction loop”)

3. Claims (7, 9-10, 13) are rejected under 35 U.S.C. 103(a) as being unpatentable over Wynn (US Patent 6,009,317), and in view of Rahman. (US Publication 2003/0174641 A1)

Re claim 7, Wynn discloses an RF receiver comprising: a first mixer and a second mixer for receiving RF signals and respectively generating a first signal and a second signal that are at about quadrature phase angles (See fig. 3: 74 & 76); and a calibration module coupled to at least one of the first mixer and the second mixer. (See fig. 3: 79 & col. 6, lines 55-65)

But the reference of Wynn fails to specifically disclose for modifying the first signal by subtracting a portion of the first signal from the first signal and combining the portion of the first signal with the second signal so as to make the phase difference of the first signal and the second signal substantially equal to 90 degrees.

However, the reference of Rahman does suggest (See fig. 5: 80, 138, 142, 144 & ¶s 34-39) the teaching of modifying the first signal (Cos(A) "unequalized I-signal") by subtracting a portion of the first signal from the first signal (0.5*sin(A-e) - 0.5*sin(A+e)) and combining the portion of the first signal with the second signal (0.5*sin(A+e) - 0.5*sin(A-e), which is equal to Sin(A)*Cos(e)) so as to make the phase difference of the first signal and the second signal substantially equal to 90 degrees. Initially, the I component was equal to Cos(A) (See fig. 5: 80 & ¶ 37) but then it was modified by multiplying with Sin(e) (See fig. 5: 138 & ¶ 35) which is equivalent to 0.5*sin(A-e) - 0.5*sin(A+e). (See¶ 38) Furthermore, one of ordinary skills would know how to make and use of these mathematical equations in an IQ phasor plane in order to achieve

orthogonality.

Therefore, taking the combined teachings of Wynn and Rahman as a whole, it would have been obvious to one of ordinary skills in the art to have incorporated this feature into the system of Wynn, in the manner as claimed and as taught by Rahman, for the benefit of providing imbalance compensation.

Re claim 9, the combination of Wynn and Rahman further discloses that wherein the phase calibration module further comprises a phase calibration device coupled between the first mixer and the second mixer. (In Wynn, see fig. 3: element 79)

Re claim 10, the combination of Wynn and Rahman further discloses an analog front end controller (AFE controller) coupled to and controlling the phase calibration module so as to make the phase difference of the first signal and the second signal substantially equal to 90 degrees. (In Wynn, see fig. 3: element 62. Furthermore, processor acts as a controller in that it controls and balances the imbalances associated with the quadrature signals.)

Re claim 13, the combination of Wynn and Rahman further discloses a GSM communications system or a WLAN communications system. (In Wynn, see col. 1, line 62, where it discloses a RF receiver.)

4. **Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wynn (US Patent 6,009,317) and Rahman. (US Publication 2003/0174641 A1), as applied to claim 7 above, and further in view of Zheng. (US Publication 2004/0002323 A1)**

Re claim 14, the combination of Wynn and Rahman fails to disclose a complex filter, having input ports electrically connected to the calibration module, for processing image cross talk caused by mismatch between the first signal and the second signal.

However, Zheng does. (See fig. 1: 20 & 50 & paragraphs 40-44) Zheng discloses a complex filter (20), having input ports electrically connected to the calibration module (50), for processing image cross talk caused by mismatch between the first signal and the second signal. (Paragraph 44)

Therefore, taking the combined teachings of Wynn, Rahman, and Zheng as a whole, it would have been obvious to one of ordinary skills in the art to have incorporated this feature into the system of Wynn, as modified by Rahman, in the manner as claimed and as taught by Zheng, for the benefit of providing imbalance compensation. (See paragraph 44)

5. **Claims (4-5) are rejected under 35 U.S.C. 103(a) as being unpatentable over Zheng. (US Publication 2004/0002323 A1) in view of Rahman. (US Publication 2003/0174641 A1)**

6. Re claim 4, Zheng discloses a method used in an RF receiver for reducing an image cross talk, the RF receiver comprising: a first mixer and a second mixer for

receiving RF signals and respectively generating a first signal and a second signal that are at about quadrature phase angles (See fig. 1: 10a & 10b); and a programmable phase calibration device coupled to the pair of mixers for reducing phase mismatch in the pair of quadrature signals when the phase mismatch causes the image cross talk (See fig. 1: 50 & paragraph 32 & 40-44); the method comprising: utilizing the pair of mixers to process the RF signal and to output the pair of quadrature signals. (See fig. 1: 10a & 10b), wherein two ports of the programmable phase calibration device are respectively connected to two output ports of the pair of mixers.(See fig. 1: 10a, 10b, 50, and paragraph 30)

But the reference of Zheng fails to specifically disclose utilizing a calibration module to reduce the phase mismatch in the pair of quadrature signals through subtracting a portion of the first signal from the first signal and modifying the second signal by a portion of the first signal.

However, the reference of Rahman does suggest (See fig. 5: 80, 138, 142, 144 & ¶s 34-39) the teaching of utilizing a calibration module (See fig. 5) to reduce the phase mismatch in the pair of quadrature signals through modifying the first signal (Cos(A) "unequalized I-signal") by subtracting a portion of the first signal from the first signal (0.5*sin(A-e) - 0.5*sin(A+e)) and modifying the second signal by a portion of the first signal. (0.5*sin(A+e) - 0.5*sin(A-e), which is equal to Sin(A)*Cos(e)) Initially, the I component was equal to Cos(A) (See fig. 5: 80 & ¶ 37) but then it was modified by multiplying with Sin(e) (See fig. 5: 138 & ¶ 35) which is equivalent to 0.5*sin(A-e) - 0.5*sin(A+e). (See¶ 38) Furthermore, one of ordinary skills would know how to make

and use of these mathematical equations in an IQ phasor plane in order to achieve orthogonality.

Therefore, taking the combined teachings of Zheng and Rahman as a whole, it would have been obvious to one of ordinary skills in the art to have incorporated this feature into the system of Zheng, in the manner as claimed and as taught by Rahman, for the benefit of providing imbalance compensation.

Re claim 5, the combination of Zheng and Rahman further discloses utilizing the programmable phase calibration device to compensate the portion of the first signal to the second signal so that phase difference between the compensated second signal and the first signal becomes 90 degrees. (In Rahman, see fig. 5: 146 & paragraph 35 "I/Q phase imbalance correction loop")

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LEON FLORES whose telephone number is (571)270-1201. The examiner can normally be reached on Mon-Fri 7-5pm Alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Payne can be reached on 571-272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/L. F./
Examiner, Art Unit 2611
April 30, 2008

/David C. Payne/

Supervisory Patent Examiner, Art Unit 2611